

THE CLAIMS

Listing of Claims:

1. (Previously presented) A drive circuit, comprising:

a plurality of digital-to-analog conversion circuits each of which selects one of difference reference voltages corresponding to a digital gradation signal; and

a sampling circuit which selectively connects each output terminal of two of the digital-to-analog conversion circuits to signal lines,

wherein the digital-to-analog conversion circuit between the selected reference voltage and the output terminal of the digital-to-analog conversion circuit includes a variable resistor circuit with a resistance value corresponding to a digital gradation signal;

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected reference voltages is generated by a series resistance comprising a resistance value of the variable resistance circuit and a resistance value of the switches constituting the sampling circuit.

2. (Previously presented) A drive circuit, comprising:

a plurality of digital-to-analog conversion circuits each of which selects one of difference reference voltages corresponding to a digital gradation signal;

a plurality of switching element groups including a plurality of switching elements which are connected to each other in parallel, wherein each of which has a

difference resistance value when active, connects to a corresponding output terminal of the digital-to-analog conversion circuit and is controlled according to a digital gradation signal;

a sampling circuit which selectively connects each output terminal of two of a plurality of switching element groups to a plurality of signal lines,

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected reference voltages is generated by a series resistance comprising a resistance value of the switching element group and a resistance value of the switches constituting the sampling circuit.

3. (Previously presented) A drive circuit, comprising:

a plurality of digital-to-analog conversion circuits each of which connects one of difference reference voltages corresponding to a digital gradation signal; and

a sampling circuit which selectively connects each output terminal of two of a plurality of variable resistor circuits to one of a plurality of signal lines,

wherein each output terminal of the digital-to-analog conversion circuits connects to a corresponding variable resistor circuit with a resistance value corresponding to a digital gradation signal, and

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected reference voltages is

generated by a series resistance comprising a resistance value of the variable resistance circuit and a resistance value of the switches constituting the sampling circuit.

4. (Previously presented) A drive circuit, comprising:

a plurality of digital-to-analog conversion circuits each of which outputs an analog signal corresponding to a digital gradation signal; and

a sampling circuit which selectively connects each output terminal of two of a plurality of variable resistor circuits to a corresponding one of a plurality of signal lines,

wherein each output terminal of the digital-to-analog conversion circuit connects to a corresponding variable resistor circuit with a resistance value corresponding to a digital gradation signal,

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected reference voltages is generated by a series resistance comprising a resistance value of the variable resistance circuit and a resistance value of the switches constituting the sampling circuit.

5. (Previously presented) The drive circuit according to claim 3, wherein said plurality of variable resistor circuits include switching elements which conduct according to said gradation signal as the resistors with resistance values corresponding to said gradation signal.

6. (Previously presented) The drive circuit according to claim 4, wherein said plurality of variable resistor circuits include switching elements which conduct according to said gradation signal as the resistors with resistance values corresponding

to said gradation signal.

7. (Previously presented) The drive circuit according to claim 3, wherein said plurality of variable resistor circuits include switching elements which conduct according to said gradation signal and resistance elements, connected in series with each other, as the resistors with resistance values corresponding to said gradation signal.

8. (Previously presented) The drive circuit according to claim 4, wherein said plurality of variable resistor circuits include switching elements which conduct according to said gradation signal and resistance elements, connected in series with each other, as the resistors with resistance values corresponding to said gradation signal.

9. (Previously presented) A drive circuit, comprising:

a plurality of first digital-to-analog conversion circuits each of which selects one of difference positive reference voltages corresponding to a digital gradation signal;

a plurality of second digital-to-analog conversion circuits each of which selects one of difference negative reference voltages corresponding to a digital gradation signal; and

a sampling circuit which selectively connects each output terminal of two of the first digital-to-analog conversion circuits and each output terminal of two of the second digital-to-analog conversion circuits to signal lines,

wherein the first digital-to-analog conversion circuit between the selected positive reference voltage and the output terminal of the digital-to-analog conversion circuit includes a variable resistor circuit with a resistance value corresponding to a

digital gradation signal;

wherein the second digital-to-analog conversion circuit between the selected negative reference voltage and the output terminal of the digital-to-analog conversion circuit includes a variable resistor circuit with a resistance value corresponding to a digital gradation signal;

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected two of the positive reference voltages or a divided voltage point of the selected two of the negative reference voltages is generated on the signal lines by a series resistance comprising a resistance value of the variable resistance circuit and a resistance value of the switch constituting the sampling circuit.

10. (Previously presented) A drive circuit, comprising:

a plurality of first digital-to-analog conversion circuits each of which selects one of difference positive voltages corresponding to a digital gradation signal;

a plurality of first switch element groups including a plurality of switching elements which are connected to each other in parallel, wherein each of which has a difference resistance value when active, connects to a corresponding output terminal of the digital-to-analog conversion circuit and is controlled according to a digital gradation signal;

a plurality of second digital-to-analog conversion circuits each of which selects one of difference negative voltage corresponding to a digital gradation signal;

a plurality of second switch element groups including a plurality of switching elements which are connected to each other in parallel, wherein each of which has a difference resistance value ~~in~~when active, connects to a corresponding output terminal of the digital-to-analog conversion circuit and is controlled according to a digital gradation signal;

a sampling circuit which selectively connects each output terminal of two of the first switching element groups and each output terminal of two of the second switching element groups to signal lines,

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected two of the positive reference voltages or a divided voltage point of the selected two of the negative reference voltages is generated on the signal lines by a series resistance comprising a resistance value of the first or the second switching element group and a resistance value of the switches constituting the sampling circuit.

11. (Previously presented) A drive circuit, comprising:

a plurality of first digital-to-analog conversion circuits each of which selects one of difference positive reference voltages corresponding to a digital gradation signal;

a plurality of second digital-to-analog conversion circuits each of which selects one of difference negative reference voltages corresponding to a digital gradation signal; and

a sampling circuit which selectively connects each output terminal of two

first variable resistor circuits and each terminal of two of second variable resistor circuits to signal lines,

wherein each output terminal of the first digital-to-analog conversion circuits connects to a corresponding first variable resistor circuit with a resistance value corresponding to a digital gradation signal;

wherein each output terminal of the second digital-to-analog conversion circuits connects to a corresponding second variable resistor circuit with a resistance value corresponding to a digital gradation signal,

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value;

wherein a divided voltage point of the selected two of the positive reference voltages or a divided voltage point of the selected two of the negative reference voltages is generated on the signal lines by a series resistance comprising resistance value of the variable resistance circuit and a resistance value of the switches constituting the sampling circuit.

12. (Previously presented) A drive circuit, comprising:

a plurality of first digital-to-analog conversion circuits each of which outputs a positive analog voltage corresponding to a digital gradation signal;

a plurality of second digital-to-analog conversion circuits each of which outputs a negative analog voltage corresponding to a digital gradation signal; and

a sampling circuit in which each output terminal selectively connects each of two terminals of the plurality of first variable resistor circuits and two terminals of

at the plurality of second variable resistor circuits to a corresponding one of signal lines,

wherein each output terminal of the first digital-to-analog conversion circuits connects to a corresponding first variable resistor circuit with a resistance value corresponding to a digital gradation signal,

wherein each output terminal of the second digital-to-analog conversion circuits connects to a corresponding second variable resistor circuit with a resistance value corresponding to a digital gradation signal,

wherein the sampling circuit comprises a plurality of switches each of which has an approximate same resistance value; and

wherein a divided voltage point of the selected two of the positive reference voltages or a divided voltage point of the selected two of the negative reference voltages is generated on the signal lines by a series resistance comprising a resistance value of the variable resistance circuit and a resistance value of the switches constituting the sampling circuit.

13. (Previously presented) The drive circuit according to claim 11, wherein said plurality of positive variable resistor circuits and said plurality of negative variable resistor circuits include switching elements which conduct according to said gradation signal as the resistors with resistance values corresponding to said gradation signal.

14. (Previously presented) The drive circuit according to claim 12, wherein said plurality of positive variable resistor circuits and said plurality of negative variable resistor circuits include switching elements which conduct according to said gradation signal as the resistors with resistance values corresponding to said gradation signal.

15. (Previously presented) The drive circuit according to claim 11, wherein said plurality of positive variable resistor circuits and said plurality of negative variable resistor circuits include switching elements which conduct according to said gradation signal and resistance elements, connected in series with each other, as the resistors with resistance values corresponding to said gradation signal.

16. (Previously presented) The drive circuit according to claim 12, wherein said plurality of positive variable resistor circuits and said plurality of negative variable resistor circuits include switching elements which conduct according to said gradation signal and resistance elements, connected in series with each other, as the resistors with resistance values corresponding to said gradation signal.

17. (Original) The drive circuit according to claim 2, wherein among the groups of the switching elements belonging to said sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously in response to said signal line selection signal.

18. (Original) The drive circuit according to claim 4, wherein among the groups of the switching elements belonging to said sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously in response to said signal line selection signal.

19. (Previously presented) The drive circuit according to claim 10, wherein among the groups of the positive switching elements belonging to said positive sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously in response to said positive signal line selection signal and among the groups of the negative switching elements belonging to said negative sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously

in response to said negative signal line selection signal.

20. (Previously presented) The drive circuit according to claim 12, wherein among the groups of the positive switching elements belonging to said positive sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously in response to said positive signal line selection signal and among the groups of the negative switching elements belonging to said negative sampling circuit, a pair of switching elements connected to the same signal line conduct simultaneously in response to said negative signal line selection signal.

21. (Previously presented) The drive circuit according to claim 2, wherein said switching elements comprise thin-film transistors.

22. (Previously presented) The drive circuit according to claim 4, wherein said switching elements comprise thin-film transistors.

23. (Previously presented) The drive circuit according to claim 8, wherein said switching elements comprise thin-film transistors.

24. (Previously presented) The drive circuit according to claim 10, wherein said switching elements comprise thin-film transistors.

25. (Previously presented) The drive circuit according to claim 1, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

26. (Previously presented) The drive circuit according to claim 2, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

27. (Previously presented) The drive circuit according to claim 3, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

28. (Previously presented) The drive circuit according to claim 4, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

29. (Previously presented) The drive circuit according to claim 7, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

30. (Previously presented) The drive circuit according to claim 8, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

31. (Previously presented) The drive circuit according to claim 9, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

32. (Previously presented) The drive circuit according to claim 10, wherein said difference reference voltages are fewer in number than the gradations of displayed images.

33. (Original) An image display apparatus equipped with the drive circuit according to claim 1, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an

electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

34. (Original) An image display apparatus equipped with the drive circuit according to claim 2, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

35. (Original) An image display apparatus equipped with the drive circuit according to claim 3, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

36. (Original) An image display apparatus equipped with the drive circuit according to claim 4, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on

said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

37. (Original) An image display apparatus equipped with the drive circuit according to claim 7, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

38. (Original) An image display apparatus equipped with the drive circuit according to claim 8, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

39. (Original) An image display apparatus equipped with the drive circuit according to claim 9, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning

lines are connected to a scanning circuit.

40. (Original) An image display apparatus equipped with the drive circuit according to claim 10, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, an electro-optical conversion element which changes its light transmittance or emission intensity in response to an electrical signal is placed near each intersection of the signal lines and scanning lines on said substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

41. (Original) An image display apparatus equipped with the drive circuit according to claim 7, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, liquid crystals which change their light transmittance in response to an electrical signal are placed near each intersection of the signal lines and scanning lines on said substrate, said liquid crystals are sandwiched between said substrate and another substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

42. (Original) An image display apparatus equipped with the drive circuit according to claim 8, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, liquid crystals which change their light transmittance in response to an electrical signal are placed near each intersection of the signal lines and scanning lines on said substrate, said liquid crystals are sandwiched between said substrate and another substrate, said signal lines are

connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

43. (Original) An image display apparatus equipped with the drive circuit according to claim 9, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, liquid crystals which change their light transmittance in response to an electrical signal are placed near each intersection of the signal lines and scanning lines on said substrate, said liquid crystals are sandwiched between said substrate and another substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

44. (Original) An image display apparatus equipped with the drive circuit according to claim 10, wherein a plurality of signal lines for transmitting image signals and a plurality of scanning lines for transmitting scanning signals are formed in a matrix-like fashion in an image display area of a substrate, liquid crystals which change their light transmittance in response to an electrical signal are placed near each intersection of the signal lines and scanning lines on said substrate, said liquid crystals are sandwiched between said substrate and another substrate, said signal lines are connected to said drive circuit, and said scanning lines are connected to a scanning circuit.

45. (Previously presented) The image display apparatus according to claim 41, wherein said switching elements comprise thin-film transistors.

46. (Previously presented) The image display apparatus according to claim 42, wherein said switching elements comprise thin-film transistors.

47. (Previously presented) The image display apparatus according to claim 43, wherein said switching elements comprise thin-film transistors.

48. (Previously presented) The image display apparatus according to claim 44, wherein said switching elements comprise thin-film transistors.

49. (Previously presented) The image display apparatus according to claim 41, wherein said reference voltages are fewer in number than the gradations of displayed images.

50. (Previously presented) The image display apparatus according to claim 42, wherein said reference voltages are fewer in number than the gradations of displayed images.

51. (Previously presented) The image display apparatus according to claim 43, wherein said reference voltages are fewer in number than the gradations of displayed images.

52. (Previously presented) The image display apparatus according to claim 44, wherein said reference voltages are fewer in number than the gradations of displayed images.